

FRASER FIR STAND STRUCTURE IN THE BLACK MOUNTAINS OF NORTH CAROLINA

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Over the past several decades, naturally occurring populations of Fraser fir (*Abies fraseri* [Pursh.] Poir) have experienced devastating mortality rates due to attack by the exotic insect, balsam woolly adelgid (BWA) (*Adelges piceae* Ratz.). The decline in Fraser fir is particularly concerning because its natural geographic distribution is limited to seven disjunct mountaintop regions in the Southern Appalachians. Fraser fir is ecologically valuable and unique because it plays a crucial role in maintaining the integrity and composition of the spruce-fir forest ecosystem. Objectives of this study were to: 1) characterize Fraser fir stand structure 60 years after BWA infestation; 2) use current stand structure to make inferences about whether or not Fraser fir trees are following a cycle of regeneration-mortality that could lead to eventual decline of the population; 3) determine what role, if any, slope, elevation, aspect, and past land use history have on stand structure, mortality, and infestation level; and 4) use high-resolution aerial photography to visualize changes in spruce-fir cover in the Black Mountains over a 50-year period. Forty-four circular plots, ranging from 3.0 m to 8.5 m radius, were sampled in the Black Mountains, North Carolina, from June through September 2008. We found a significant difference between the mean diameter at breast height (d.b.h.) of live trees and dead trees over 4 cm. Mean d.b.h. of live trees was 9.89 cm. Mean d.b.h. of standing dead trees was 5.44 cm. Fraser fir mortality per plot ranged from 0 to 65.7 percent. Elevation was the only geographic variable found to significantly influence Fraser fir mortality. Forty-four percent of trees exhibited symptoms of BWA infestation but did not have BWA present at the time of sampling. Analysis of aerial photographs from 1954 and 1988 revealed that Fraser fir dominated forests with canopy cover greater than 50 percent, decreased nearly 80 percent over the time period, while spruce-fir codominated forests with canopy cover greater than 50 percent increased 209 percent. Preliminary results indicate that Fraser fir is not following a cycle of regeneration-mortality in the Black Mountains. Changes in spruce-fir cover over time can be linked to human induced disturbance factors and the invasive BWA.

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